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ABSTRACT

This paper describes an educational package to help the learning process. A case study is presented of an energy distribution course in the Electrical Engineering Department at the Federal University of Espirito Santo (UFES). The advantages of the developed package are shown by comparing it with the traditional academic book. This package presents the appropriate contents to the student, instigating his/her knowledge. Relying on a particular model of each student, the tasks proposed to the students can be suited to the learning process of each individual user. (Author/YDS)

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An Interactive Computer Aided Electrical Engineering Education Package

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Abstract *- This paper describes an education package to help the learning process. The case study is presented to energy distribution course of Electrical Engineering Department (EED) from Federal University of Espirito Santo (UFES). The advantages of the developed package are shown by comparing this one with the traditional academic book. This package presents the appropriate contents to the student, instigating his/her reactions and helping the learning process, generating questions to the students and checking his/her knowledge. Relying on a particular model of each student, the tasks proposed to the students can suit the learning process to each individual user.*

Introduction

There is a great difference between information and knowledge. Information are data. Something that is immaterial which needs a support to help as a document. Knowledge is more than just information. Knowledge needs information, but knowledge does not consist in just information. According to Edgar Morin [1], knowledge does not restrict to information, it needs theoretical structures to give sense to these information. The internet network can be seen as a virtual world which has information fast and nowadays dynamically.

The knowledge diffusion is not so easy as it seems to be. Knowledge produces new ones, but it can be acquired if the interpreter is able to decode the information. Moreover, the knowledge construction depends on the way the information are dealt. So, the interpreter must question, think over and spread the information which are received in order to the appearance of knowledge. On the other hand, the transfer of knowledge happens by the action of information and constitute knowledge, it depends on the way that the knowledge is taught.

The real command of knowledge is science. We can say that the power is in the hands of people who have knowledge, or the power belongs to people who know how to change information to knowledge.

According to Bloom [2], knowledge has many meanings, that is to say, it contains a division in six levels: information, comprehension, application, analysis, synthesis and exam. In the information level, there are properties and characteristics of a study object. In comprehension level, there are the understanding abilities of the subject that is been studying, that is to say, the construction of an image. The application level shows how to use the information. The analysis level consists of identifying the parts of the information and the synthesis level uses the concept to synthesize, that is to say, to produce abstractions. Finally the exam level expresses the capacity of comparison.

The usage of computer as an auxiliary tool in the apprenticeship appeared naturally and the software package appeared as an important and fundamental element in the apprenticeship process. Both the computers and software package constitute just a way to get the information.

Trying to give a better basement to the knowledge process, in [3] there is a proposal in two linguistic levels: the declarative and the proceeding. In [4], it tries to show that teaching maths through modeling can be a way to make the student realize the importance of maths. In [5], it appears some aspects of teaching to help the development of a subject contents from the teacher, using the resource of didactic-pedagogic support which help to motivate the classes.

The suggestion of this work is to bring the experience acquired during the implementation and along the use of the developed education package. The main idea is to attend the apprenticeship process the students of the electrical engineering course at UFES. Our experience with the distribution of electrical energy subject has incited and indicated the ways to the student in search of information about the subject, through the use of education package as a didactic digital book. By the use of this education package we believe it makes the student to develop his/her own knowledge. The execution of tasks that is involved through the exercises happens in a moment that the student stops and thinks about the idea shown before. The kind of programming used for the development of education package has been through the paradigm of events oriented programming where the responsibility at the disposition of the tasks' execution is a responsibility of the student.

The Education Package

Students need visual simulation in order to learn and multimedia offers such simulation. This can be accomplished through the instructional style of the multimedia package. Such package should engages

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students in active learning activities. In this way, they are drawn into situation where they are part of the problem solving process.

The objective in making an education package to the apprenticeship about the contents of electrical energy distribution subject of the EED Course at UFES was to facilitate the apprenticeship process and to dispose contents which are not found in the literature till then.

We understand that the great challenge is to construct educational software which exist in Bloom's taxonomy. Therefore, in order to construct the education package proposed here, it has tried to consider the ways of getting knowledge according to Bloom, to the effect that this package can be seen as an educational software. However, before the construction of the related package, a lot of questions were asked, like these: What is to learn? How to learn? What is the beginner's aspect? It's expected that the answers to these questions are reproduced and inserted in the developed education package.

The education package is characterized by an interactive graphic interface which the student can handle the information in different levels of abstraction. The user of the education package can be people who are not students, but who have some interest about the subject.

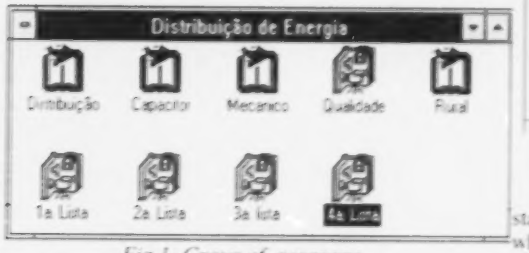

Fig 1- Group of programs

There are two modules in the package architecture developed up to now: the module Book and the module Section of tasks. They can be run by the group of programs called Distribution of Energy, as in the figure 1. The module Book is constructed exactly by five sub-modules including whole the contents of the subject. The module Section of Tasks is constituted by four kind of exercises. The different kinds of knowledge are shown in different modules, i. e., as topics, but they have similar characteristics in their presentation. The flexibility of this package can be seen through the easiness existing in doing additional changes in its modules.

The Module Book

The figure 2 shows the main interface in the module Book. As it can be observed all the topics and any section of a topic can be run directly, that is, the navigation along the book is flexible, and makes use of several multimedia resources as hypertexts, hotwords, and buttons.

Fig 2- The Main Interface

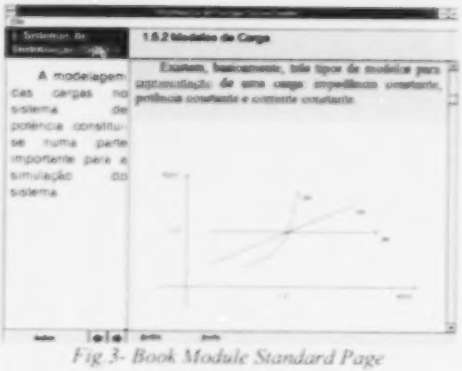

Fig 3- Book Module Standard Page

All the pages of the module Book has the same standard. The figure 3 presents one of these pages where in the field on the left there are some observations and in the field on the right is the main contents. The figures 4A, 4B and 5A, 5B present interfaces of two sub-modules of the Book.

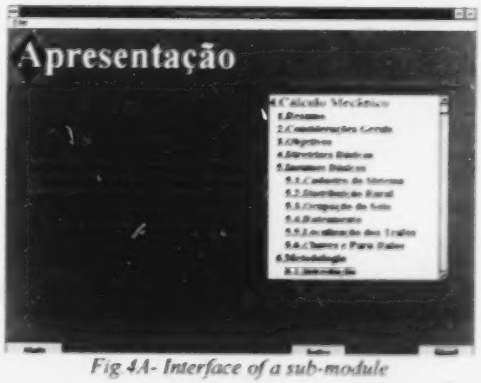

Fig 4A- Interface of a sub-module

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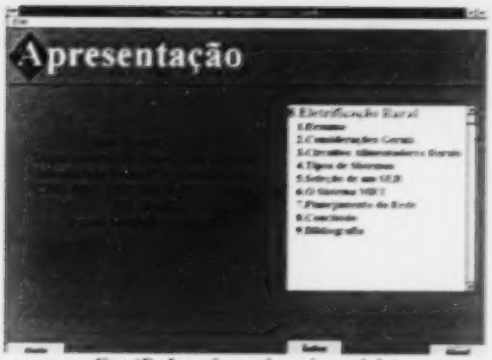

Fig 4B- Interface of a sub-module

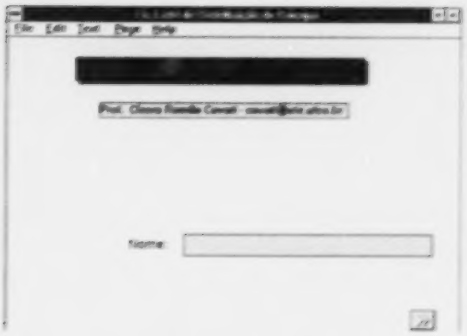

Fig. 6 – The Main Interface of a module section of tasks

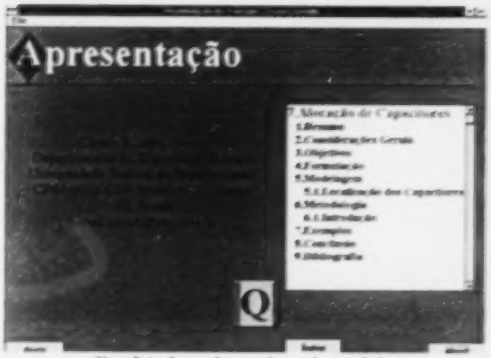

Fig 5A- Interface of a sub module

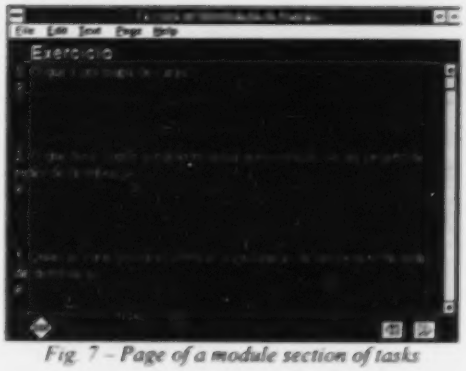

Fig. 7 – Page of a module section of tasks

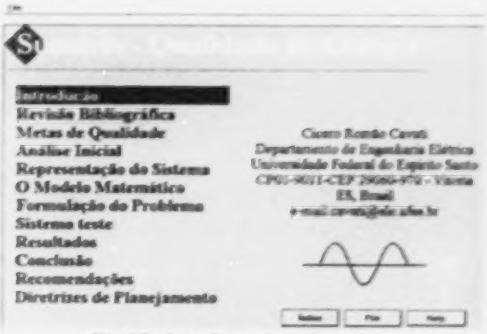

Fig 5B- Interface of a sub module

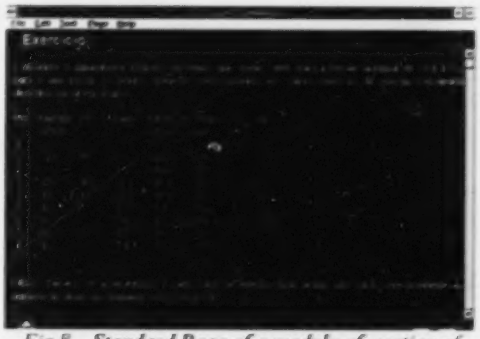

Fig 8 – Standard Page of a module of section of tasks

The module Section of Tasks

The figure 6 shows the main interface from the module Section of Tasks concerning the first type of exercises, while the figures 7 and 8 present the standard page of this module. As it can be observed, the place destined to the answer is accessible dynamically. Moreover, a lot of resources are available to the user through the pull down menu, for example the printing of the contents.

The Programming

The Characteristic of the utilized programming is the oriented events programming where: the system is constituted by a set of objects which react to the specific events; for each object there are zero or more kinds of associated events; the signaling of the event is done through messages sent to the associated object and the reaction because the events is dealt with

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handlers, which are similar to programs from conventional programming. As examples of some class of events, it can be mentioned to drag the mouse, click the right button of the mouse, press a key, select an option in the menu and save a word section. The architecture of the language used can be described by: category of elementary objects (field, pictures, texts, buttons and key words); constructors of group (group, page, background and book); hierarchy of groups; events and property by kind of object (button- handlers and picture- co-ordinate, color and size), and operations with property (change of color and position).

All the interaction between the user and the package can be synthesized by: the action of the user motives the sending of a message towards an object. It means for example that, when the user press the button of the mouse, on an object called button, the sending of two messages happens: button down and button up. However, in order to answers with a message, the object needs to have a handler joined. A handler has the following structure: heading, body and end. The heading specifies the name of the handler, the body specifies which command or message must be executed and the end stipulates the end of the handler.

The Interaction Teacher, Package and Student

The students are excited about learning the subject by using multimedia packages and this fact increase their understanding of the subject. Some complex topic are better understood than by traditional way of learning. The apprenticeship happens through an interaction process among the teacher, student and package. The modules Book and Section of Tasks are available through the set of computers of windows NT class. The students can run these modules anytime according to his/her availability finding out the respective contents, before, in the course of it and after the respective presentation in the classroom. In short the process happens in three stages basically. In the first stage is shown the contents of the course which will be studied as the tasks which will be done. In the second one, the students run the module Book. To assimilate the contents studied in the class, they do the exercises suggested in the module Section of Task as well. In this stage, there is an interaction with the teacher, when there is the opportunity of elucidating doubts originating from different provenance. Moreover, the student can save his/her work in this area of work, or in his/her diskette and in the area destined to delivery of work. In the third stage, the teacher sees the area where the solution of the tasks from each student were available. After the correction the teacher adjusts his correction along with the respective mark for the students to know about it. It is used the classroom to explain any doubt obviously, and for complements as well, when it is necessary.

Conclusion

There are advantages to use multimedia in the electrical engineering course classroom. One of these is that multimedia simulates the interest of the student. The education package presented in this paper permits a natural conception of its structure easily. The structure used permits its modification easily and its extension according to other similar systems used for the apprenticeship based in home page from the internet. In the module Book, it could be observed that the students learn better when there are illustrations which are associated to the concepts. In the module Section of Tasks, as the students are used to solving problems based in others ones solved previously, they have difficulties in solving new problems. This type of environment can be used to stimulate the students with the solution of new problems. Because this, it is necessary clarity with the formulating of problems. About the exchange between students and teacher, there is not certainty about its improvement, but this is done continuously and when the student want it finally, this environment is supposed to be contributing to the construction of knowledge and this new culture can become normal in proportion to both teachers and students become familiar with it. Finally, the developed education package can be seen as an entry point to introduce students to other related subject that in a traditional classroom is not possible to reach this goal.

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Biography

Cicero Romão Cavati (M'84) was born in Vitória-Espirito Santo, Brazil on January 27, 1955. He graduated from the Federal University of Espirito Santo (UFES) - Brazil in 1978. In 1984 he received M.S. degree from USP - Brazil. His special fields of interest included computational intelligence and mathematics programming applied to operation and expansion planning of transportation network. Since 1979, he is a professor and researcher at the Dept. of Electrical Engineering, UFES - Brazil.